

2019 AWWA Water Audit Level 1 Validation

Water System Name:

City of Arroyo Grande

Water System ID Number:

4010001

Water Audit Period:

Calendar
2019

Water Audit & Water Loss Improvement Steps:

Steps taken in preceding year to increase data validity, reduce real loss and apparent loss as informed by the annual validated water audit:

<<Information to be completed by Utility>>

- 1) 260 water meters were replaced with new meters.
- 2) 26 Water Services were replaced.
- 3) 2 water mains were repaired.

Certification Statement by Utility Executive:

This water loss audit report meets the requirements of California Code of Regulations Title 23, Division 2, Chapter 7 and the California Water Code Section 10608.34 and has been prepared in accordance with the method adopted by the American Water Works Association, as contained in their manual, *Water Audits and Loss Control Programs, Manual M36, Fourth Edition* and in the Free Water Audit Software version 5.

Utility Provided

Executive Name (Print)

Shane Taylor

Executive Position

Utilities Manager

Signature



Date

8-6-20

Water Audit Level 1 Validation – Review Document

Audit Information:

Utility: Arroyo Grande PWS ID: 4010001
System Type: Potable Audit Period: Calendar 2019
Utility Representation: Shane Taylor, Tim Schmidt
Validation Date: 7/22/2020 Call Time: 8:30 am Sufficient Supporting Documents Provided: Yes

Validation Findings & Confirmation Statement:

Key Audit Metrics:

Data Validity Score: 56 Data Validity Band (Level): Band III (51-70)
ILI: 0.34 Real Loss: 4.97 (gal/conn/day) Apparent Loss: 7.16 (gal/conn/day)
Non-revenue water as percent of cost of operating system: 2.0%

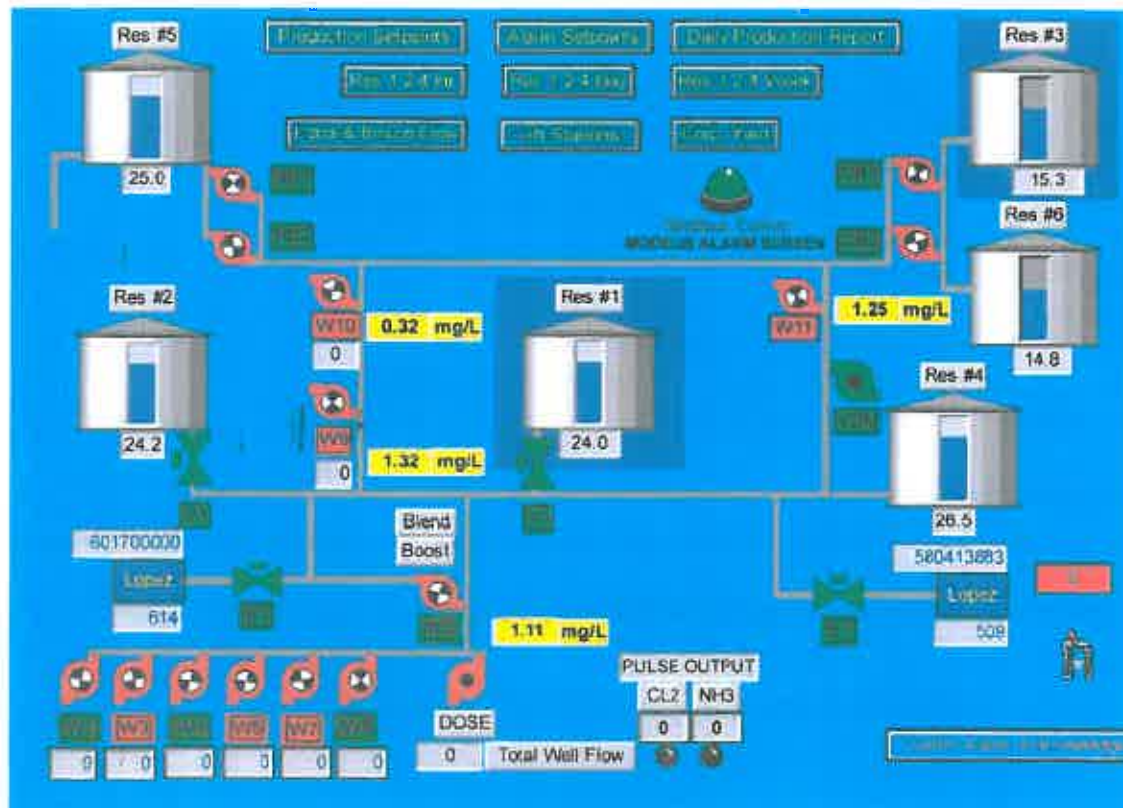
Certification Statement by Validator:

This water loss audit report has been Level 1 validated per the requirements of California Code of Regulations Title 23, Division 2, Chapter 7 and the California Water Code Section 10608.34.

All recommendations on volume derivation and Data Validity Grades were incorporated into the water audit. ☑

Validator Information:

Water Audit Validator: Drew Blackwell Validator Qualifications: Certified Water Audit Validator (CA)

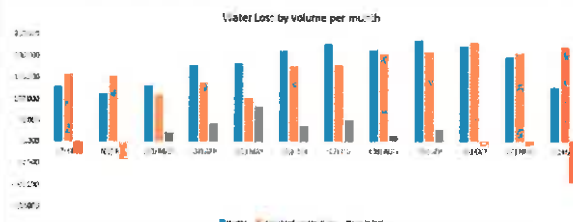


Main Screen

SCADA1-DT2 03/14/18 13:45

#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
1	Volume from Own Sources	VOS	3	<p>Supply meter profile: Eight ground water wells of which are in an adjudicated basin. Groundwater is utilized after "take or pay" volume is purchased. Meters are turbine meters with pulse output. Wells 9 and 10 go through pressure filter. Well 11 recently brought online but no production in 2019.</p> <p>VOS input derived from: SCADA reads from production meters as archived.</p> <p>Comments: Input derivation from supporting documents confirmed. Exclusion of non-potable volumes confirmed. Error found in August supply number and changed to 21.6 AF.</p> <p>Well meter volumes per month requested and received. Difference of 1 AF detected and applied to the VOS.</p>	<p>Percent of own supply metered: 100%</p> <p>Signal calibration frequency: None.</p> <p>Volumetric testing frequency: None.</p> <p>Volumetric testing method: n/a.</p> <p>Percent of own supply tested and/or calibrated: n/a.</p> <p>Comments: Grade of 3 based on no testing.</p>
2	VOS Master Meter & Supply Error Adjustment	VOS MMSEA	5	<p>Input derivation: Left blank in absence of available test data.</p> <p>Net storage change included in MMSEA input: No.</p> <p>Comments: Storage volume changes are not applicable for this system. Input volume is fed directly into the distribution system and the storage reservoirs essentially act as one of the customers.</p>	<p>Supply meter read frequency: Continuous.</p> <p>Supply meter read method: Automatic logging via SCADA telemetry.</p> <p>Frequency of data review for trends & anomalies: Each business day.</p> <p>Storage levels monitored in real-time: Yes.</p> <p>Comments: Corrections to data gaps in SCADA on weekly basis as the limiting criteria for DVG.</p>
3	Water Imported	WI	3	<p>Import meter profile: Purchase water from San Luis Obispo County (Lopez) through 2 connections, each with 10" meters owned by the County. These meters were replaced in 2018.</p> <p>WI input derived from: Input from Lopez (County) SCADA totalization.</p> <p>Totalization of volumes per manual weekly reads and daily SCADA redundant meter reads by utility.</p> <p>Comments: Input derivation from supporting documents confirmed. Exclusion of non-potable volumes confirmed. Although there are 2 turnouts/meters, the County does not provide information per meter, just monthly totals.</p>	<p>Percent of import supply metered: 100%</p> <p>Signal calibration frequency: None.</p> <p>Volumetric testing frequency: None.</p> <p>Volumetric testing method: n/a.</p> <p>Percent of import supply tested and/or calibrated: n/a.</p> <p>Comments: Consider requesting signal calibration records along with methods & frequency to obtain documented results for review in future audits. Grade of 3 based on records of electronic calibration.</p>
4	WI Master Meter & Supply Error Adjustment	WI MMSEA	3	<p>Input derivation: Left blank in absence of available test data.</p>	<p>Import meter read frequency: Weekly.</p> <p>Import meter read method: Manual and automatic logging.</p> <p>Frequency of data review for trends & anomalies: Monthly.</p>

#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
				<p>Comments: Testing & data mgmt. provision in supply agreement: Agreement states AG can ask for testing to be completed if there is concern over the accuracy</p>	<p>Comments: Grade of 3 based on limited knowledge of any necessary corrections from the data review by the exporter.</p>
5	Water Exported	WE	n/a	<p>Export meter profile: Emergency interties: City of Grover Beach (physical connection), Pismo Beach (air gap separation)</p>	
6	WE Master Meter & Supply Error Adjustment	WE MMSEA	n/a	<p>Customer meter profile: Age profile: Meter age varies, oldest meters are 20 years old based on replacement policy Reading system: Touch. Read frequency: Read Monthly. Billing Bi-Monthly Comments: Lag-time correction is not employed in input derivation. Some months show negative water losses. While this is may be typical in a bi-monthly cycle, performing a lag time adjustment to bring supply and consumption volumes into the same timeframe may help to get more representative consumption volumes for the audit year.</p>	<p>Percent of customers metered: 100% Small meter testing policy: Work orders (exchanges) generated from billing prompt consumption testing. Meters are pulled, some tested, repaired and re-stocked. Number of small meters tested/year: Not quantified but known to be small. Approximately 5-10 per cycle. Large meter testing policy: Generally not tested anymore. Compound meters have been replaced with new Sensus Omni meters. (2" and larger). Stopped 2in and above testing – PR challenges in midst of drought and conservation efforts. Number of large meters tested/year: Not quantified but known to be small. Meter replacement policy: Small meters based on a 20-year age threshold per A/G guidelines. Large meter replacement varies. Number of replacements/year: 260 exchanges in 2018. Billing data auditing: Standard billing QC, plus review of volumes by use type each billing cycle. Comments: Limiting criteria for DVG of 5 is limited meter testing practices.</p>
7	Billed metered	BMAC	5	<p>Input derivation from supporting documents confirmed. Bi-monthly consumptions are split between readings from east-west sides of system in alternating months. Exclusion of non-potable volumes confirmed. Billed metered consumption includes City facilities.</p>	



#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
8	Billed unmetered	BUAC	10	Hydrant hits only. SCADA reads exactly when hydrant is hit, and the estimation method is site specific.	
9	Unbilled metered	UMAC	8	Profile: Street sweeping, sewer truck and Parks water truck are filled utilizing hydrant meter. Input derivation: Direct from monthly meter readings. Comments: Input derivation from supporting documents confirmed.	Policy for billing exemptions: Limited to own facilities. Comments: Grade of 8 based on limited city uses that are metered and read monthly.
10	Unbilled unmetered	UUAC	8	Profile: Operational flushing ("Other") and fire department usage (minimal). Comments: Flushing activities greatly scaled back due to drought. 1 AF.	Comments: Flushing volumes are tracked, Fire dept uses are minimal but some use still exists. Used a default volume that allowed some room for untacked usage.
11	Unauthorized consumption	UC	5	Comments: Default input applied.	Comments: Default grade applied.
12	Customer metering inaccuracies	CMI	3	See BMAC comments regarding meter testing & replacement activities. Input derivation: Rudimentary estimate. Input revised to 2.00% based on newer meter changeouts. Comments: Large meter testing program has been reduced as older large meters are replaced by new technology meters.	Characterization of meter testing: Limited (upon request AND consumption flag only). Characterization of meter replacement: Limited (upon failure only). Comments: Grade of 3 based on the estimated input.
13	Systematic data handling errors	SDHE	5	Comments: Default input applied.	Comments: Default grade applied.
14	Length of mains	Lm	10	Input derivation: Totaled from GIS based map. Hydrant leads included: Yes. Comments: No additional comments.	Mapping format: Digital. Asset management database: In place and integrated with GIS system. Map updates & field validation: Accomplished through normal work order processes. Comments: Grade of 10 based upon agreement of GIS data and updated asset management database. Field validations have increased to validate results.
15	Number of service connections	Ns	8	Input derivation: Standard report run from billing system. Basis for database query: Location or other premise-based ID. Comments: Inactive service connections confirmed. Includes fire connections.	CIS updates & field validation: Accomplished through normal meter reading processes. Estimated error of total count within 2%. Comments: Grade of 8 based on thorough billing service records and procedures. Internal audits by finance department.

#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
16	Ave length of cust. service line	Lp	10	Comments: Default input and grade applied, as customer meters are typically located at the property boundary given California climate.	
17	Average operating pressure	AOP	5	<p>Number of zones, general profile: Total of seven zones with the main zone gravity fed from the primary water source connection. Moderate elevation variability in terrain.</p> <p>Typical pressure range: 30 to 105</p> <p>Input derivation: Calculated as simple average from analysis of field data.</p> <p>Comments: Consider utilizing available pressure data from real-time monitored locations out of SCADA to help inform overall input.</p>	<p>Extent of static pressure data collection: Hydrant pressures taken during routine system flushing and/or hydrant testing.</p> <p>Characterization of real-time pressure data collection: Basic - telemetry or pressure logging at boundary points (supply locations, tanks, PRVs, boosters).</p> <p>Hydraulic model: In place and calibrated within the last 5 years.</p> <p>Comments: Grade of 5 based on the basic collection of telemetry pressure data.</p>
18	Total annual operating cost	TAOC	10	<p>Input derivation: From official financial reports.</p> <p>Comments: Confirmed costs limited to water only, and water debt service included.</p> <p>Input derivation: Total consumptive revenue divided by Billed Metered Authorized Consumption. Sewer charges are based on water meter readings. Sewer revenues are incorporated into calculation.</p> <p>Comments: Multiple classes, residential includes tiers. Calculation has been revised to include sewer consumption. Consider the method of using water and sewer consumption total sales divided by billed metered in lieu of consumption averaging.</p>	<p>Frequency of internal auditing: Annually.</p> <p>Frequency of third-party CPA auditing: Annually.</p> <p>Comments: No additional comments.</p> <p>Characterization of calculation: Weighted average composite of all rates. Input calculations have not been reviewed by an M36 water loss expert.</p> <p>Comments: No additional comments.</p>
19	Customer retail unit cost	CRUC	5	<p>The Arroyo Grande team is off to a great start in calculating the CRUC value more robustly. The calculation provided was performed correctly – revenue divided by billed metered consumption – however it was determined that the revenue included base fees. The nominator should only include consumptive revenue. In order to assign an appropriate value, the lowest consumptive tier rate for single family residential was applied and the data grade adjusted accordingly.</p> <p>For 2020, it's encouraged to continue working on the CRUC calculation by extracting the base fees.</p>	

#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
20	Variable production cost	VPC	10	<p>DVG adjusted to 5 because revenue / BMAC</p> <p>Supply profile: Import supply only (power and chemical costs deemed negligible).</p> <p>Primary costs included: Purchase costs and supply & distribution power.</p> <p>Secondary costs included: None currently included.</p> <p>Comments: No additional comments.</p>	<p>Characterization of calculation: Unit purchase cost. Input calculations have not been reviewed by an M36 water loss expert.</p> <p>Comments: Grade of 10 based on using import purchase cost. The 2% of total volume from well production and associated costs were deemed negligible and had insignificant impact on the VPC.</p>

Key Audit Metrics

(~)	VALIDITY	Data Validity Score: 56	Data Validity Band (Level): Band III (51-70)
(#)	VOLUME	ILI: 0.34	Real Loss: 4.97 (gal/conn/day) Apparent Loss: 7.16 (gal/conn/day)
(\$)	VALUE	Annual Cost of Real Losses: \$59,322	Annual Cost of Apparent Losses: \$86,075

Infrastructure & Water Loss Management Practices:

Infrastructure age profile: **33 years average**

Infrastructure replacement policy (current, historic): **Based on CIP and Water master plan**

Estimated main failures/year: **7 (2018)** Estimated service failures/year: **11 (2018)**

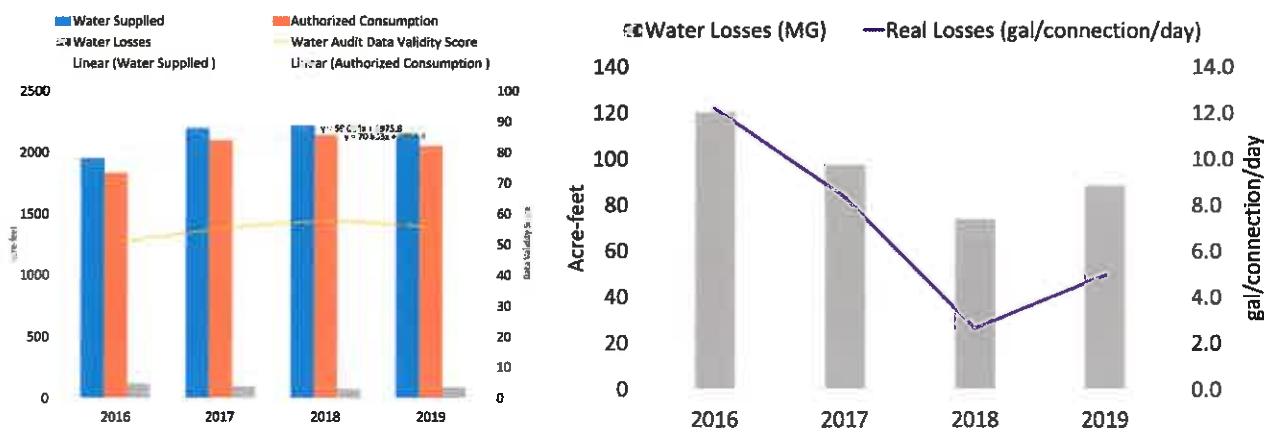
Extent of proactive leakage management: **None currently in place.**

Other water loss management comments: **Have leak detection equipment for necessary applications.**

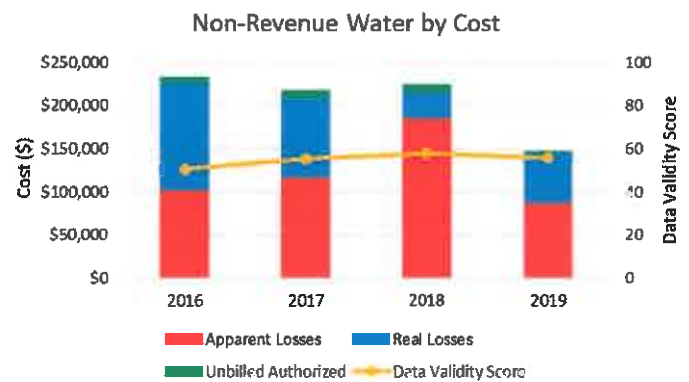
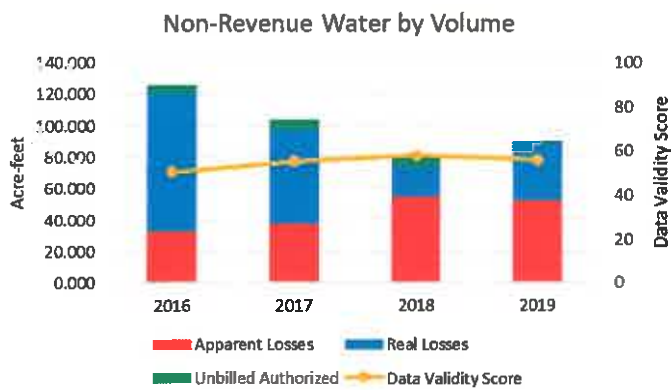
Comments on Audit Metrics & Validity Improvements

The Infrastructure Leakage Index (ILI) of 0.34 describes a system that experiences leakage at 0.34 times the modeled technical minimum for its system characteristics. While this system may experience low volumes of leakage, the ILI after level 1 validation indicates that **advanced validation may be warranted** before conclusions can be made regarding the system's leakage. At least one of the following scenarios may contribute to this result:

- **Water Supplied (both Own Source and Imported Water) may be understated.** This can occur if supply meters are under-registering more significantly than is currently reflected in the Master Meter Error & Supply Adjustment (MMSEA). This can also occur if the supply volumes include uncorrected inaccuracies in the data archives due to data gaps or SCADA formula errors.
- **Authorized consumption may be overstated.** This can occur if sales volumes have not been pro-rated to align consumption with dates of actual use instead of the dates of meter reads. This can also occur if the BMAC input includes any non-potable volumes or duplication/exclusion of potable volumes.
- **The estimate of average operating pressure may be too high,** thereby overestimating the technical minimum volume of leakage for the system.



The largest component of non-revenue water component by volume has shifted from real losses in 2016 to apparent losses in 2018 and 2019. The largest components of non-revenue water component by cost are apparent losses. Caution should be taken before taking any actionable steps based on this information with an ILI < 1.0. A reasonable next step to consider would be to **perform a Level 2 Validation of the billing data.**



The Data Validity Score falling within Band III (51-70) suggests that next steps may be focused simultaneously on improving data reliability and evaluating cost-effective interventions for water & revenue loss recovery. Opportunities to improve the reliability of audit inputs and outputs include:

- Improved understanding of Supply Meter (Own or Import) Master Meter Error: consider adopting or increasing the rigor of a source meter volumetric testing and calibration program, informed by the guidance provided in AWWA Manual M36 – Appendix A.
 - Assess the feasibility of annual volumetric accuracy testing and/or electronic calibration
- Improved estimation of CMI: consider a customer meter testing program which tests a sample of random meters whose stratification (by size, age, or other characteristics) represents the entire customer meter stock.
- Temporal alignment of Billed Metered Authorized Consumption with Water Supplied: consider pro-rating the first and last months of the audit period to better align consumption with actual dates of use and using read date as basis for reporting.
- Level 2 validation on raw data for Billed Metered Authorized Consumption to determine and resolve any instances of potable volume duplication or non-potable volume inclusion.

Further Recommendations

Since Data Validity Score is >50, consider follow-on implementations as described in the AWWA M36 Manual, once the annual water audit is established:

- Conduct a Real Loss Component Analysis to develop your leakage profile.
- Conduct an Apparent Loss Component Analysis to develop your apparent loss profile.
- Cost-benefit analysis & target setting for water loss components.
- Design & implement water loss control program for cost-effective interventions.

